

APPLICANT(S): AMIR, Nehemia  
SERIAL NO.: 09/120,973  
FILED: July 22, 1998  
Page 2

### AMENDMENTS TO THE CLAIMS

Please add or amend the claims to read as follows, and cancel without prejudice or disclaimer to resubmission in a divisional or continuation application claims indicated as cancelled:

1-4. (Canceled).

5. (Currently amended) ~~The system according to claim 4, An acoustic noise reduction system for reducing the effects of a noise source, comprising:~~

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself; and

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal,

wherein said input transducer means is located in relatively close proximity to said output actuator means, and wherein said correction means comprises:

storage means for storing a plurality of coefficients;

coefficient processing means for dynamically updating the values of said plurality of coefficients stored in said storage means; and

means for generating a corrected input signal from the contents of said storage means and said input signal,

wherein said means for generating a corrected input signal comprises a multiplier.

6. (Currently amended) ~~The system according to claim 4, An acoustic noise reduction system for reducing the effects of a noise source, comprising:~~

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself; and

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal,

wherein said input transducer means is located in relatively close proximity to said output actuator means, and wherein said correction means comprises:

storage means for storing a plurality of coefficients;

coefficient processing means for dynamically updating the values of said plurality of coefficients stored in said storage means; and

means for generating a corrected input signal from the contents of said storage means and said input signal,

wherein said storage means is divided into regions whereby a particular range of input signal values map to the same coefficient value.

7. (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer

B1  
cont

means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and

calibration means for dynamically updating said correction means in response to the input signal and the output of said correction means,

wherein said input transducer means is located in relatively close proximity to said output actuator means.

8. (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and

an equalizer for compensating the frequency response gain and group delay of said system,

wherein said input transducer means is located in relatively close proximity to said output actuator means.

9. (Canceled).

10. (Currently amended) ~~The system according to claim 1, An acoustic noise reduction system for reducing the effects of a noise source, comprising:~~

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself; and

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal,

wherein said input transducer means is located in relatively close proximity to said output actuator means,

wherein said echo cancellation means comprises:

a shift register whose parallel outputs are divided into a plurality of N portions;

a plurality of N finite impulse response (FIR) means wherein each N<sup>th</sup> portion of said shift register coupled to the input of the N<sup>th</sup> FIR means; and

a plurality of N adaptation circuits wherein one adaptation circuit is associated with each of N FIR means, and

wherein said N FIR means combine to yield an FIR filter whose length is equivalent to the combined length of said N FIR means, whereby the length of each FIR means is less ~~then~~ than or equal to the period of a noise cycle.

11. (Currently amended) ~~The system according to claim 1,~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself; and  
antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal.

wherein said input transducer means is located in relatively close proximity to said output actuator means, and wherein said antinoise means comprises:

a variable gain amplifier operative to generate an amplified signal 180 degrees opposite in phase from said input signal; and

gain control means for dynamically controlling the gain of said variable gain amplifier.

B1  
Cont  
12. (Original) The system according to claim 11, wherein said gain control means is adapted to receive a manual input control signal from a user which determines the gain of said variable gain amplifier, said user able to vary the location of a quiet zone generated by said system by varying said input control signal.

13. (Original) The system according to claim 12, wherein said input control signal is generated by said user remotely from said system and transmitted to said system via wireless communication means.

14. (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and  
anti alias filter means for removing alias frequencies from said input signal,  
wherein said input transducer means is located in relatively close proximity to said output actuator means.

*well known*  
15. (Currently amended) The system according to claim 14, wherein said anti alias filter means comprises a low pass filter having a cutoff frequency sufficiently high enough so as to reject frequencies greater ~~then~~ than the sampling rate utilized within said system.

*B1*  
*Cont*  
16. (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and

a low pass filter operative to reduce oscillations present in the system derived from feedback of the acoustic output field to said input transducer,

wherein said input transducer means is located in relatively close proximity to said output actuator means.

*1/17.* (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

APPLICANT(S): AMIR, Nehemia  
SERIAL NO.: 09/120,973  
FILED: July 22, 1998  
Page 8

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;

antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and

delay cancellation means for reducing the effect of echo signals caused by said antinoise means sensed by said input transducer,

wherein said input transducer means is located in relatively close proximity to said output actuator means.

- 81  
cont
18. (Original) The system according to claim 17, wherein said delay cancellation means comprises a digital filter whose output is added to the output of said antinoise means.
  19. (Original) The system according to claim 17, wherein said delay cancellation means comprises a plurality of delay cancellation circuits wherein each delay cancellation circuit is operative to reduce the effect of the echo caused by previous delay cancellation circuits.
  20. (Original) The system according to claim 18, wherein said digital filter comprises a finite impulse response (FIR) digital filter.
  21. (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;

output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;

correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;

APPLICANT(S): AMIR, Nehemia  
SERIAL NO.: 09/120,973  
FILED: July 22, 1998  
Page 9

echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;  
antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and  
means for sampling the acoustic noise field at a sampling rate approximately 1000 times or greater than the frequency of the noise source,  
wherein said input transducer means is located in relatively close proximity to said output actuator means.

B1  
Cont  
22. (Canceled).

23. (Currently amended) ~~The system according to claim 1, further comprising~~ An acoustic noise reduction system for reducing the effects of a noise source, comprising:

input transducer means for sensing the acoustic noise field generated by the noise source and for generating an input signal therefrom;  
output actuator means for generating an acoustic output field that is effective to reduce the level of the acoustic noise field;  
correction means for adjusting the input signal generated by said input transducer to compensate for the non linear characteristics of said input transducer and output actuator;  
echo cancellation means for removing from the input signal a portion of the output of said output actuator means fed back through said input transducer means, the output of said echo cancellation means representing a signal corresponding to substantially the noise source by itself;  
antinoise means for generating an antinoise signal opposite in phase to said input signal, said output actuator means generating said acoustic output field from said antinoise signal; and  
means for sampling a particular point of the noise source having an arbitrary phase and effectively canceling noise radiated from other points of the noise source having the same phase,  
wherein said input transducer means is located in relatively close proximity to said output actuator means.

24-27. (Canceled).



APPLICANT(S): AMIR, Nehemia  
SERIAL NO.: 09/120,973  
FILED: July 22, 1998  
Page 10

28 - 54 (Withdrawn)

B1  
55. (New) The system of claim 5, wherein said input transducer means comprises a microphone.

Cont  
56. (New) The system of claim 5, wherein said output actuator means comprises at least one loudspeaker.

---